Chapter Two

Demographics and Materials Generation and Recovery Levels

Tables 2.1 and 2.2 present demographic information, including community type, population, average income, waste generation, and recovery rates for the 30 communities studied. These communities range in size from the rural Town of Bowdoinham, Maine, with a population of 2,189, to the large urban center of Philadelphia, with a population of 1.6 million. Nine are urban areas, ten are suburbs or cities with populations under 100,000, seven are rural towns, and the remaining four are counties, which contain either rural, suburban, and /or urban areas. Communities selected for study also represent widely divergent socioeconomic levels and geographical regions, from the small-scale manufacturing and agricultural community of Wapakoneta, Ohio to Naperville, Illinois, a wealthy suburb of Chicago. Income levels range from $8,000 per capita in Newark, New Jersey to $22,000 per capita in Peterborough, New Hampshire.[1]

Demographics and Yard Debris Affect Debris Generation Rates

Tables 2.2 and 3.1 (page 15) list per capita residential and municipal solid waste generation for each community in our study where available.[2] Waste generation rates vary greatly among communities.[3] The rural communities within our sample generally have the lowest waste generation levels. (See Charts 2.1 and 2.2.) Residents in rural communities may generate less waste due to different eating and buying habits. In such communities, residents may grow and prepare a good portion of their food at home, reducing the generation of packaging waste. Most of the rural communities in our sample also have volume-based refuse collection rates (which provide residents with an incentive to reduce waste generation), have extensive backyard composting programs, and in some cases, burn waste in yards and fireplaces. For example, in the rural community of La Crescent, Minnesota, waste burning is permitted for residents living on more than 40 acres.

The waste generation levels of suburban communities and small cities vary greatly. Those generating large volumes of yard debris—particularly those with mature deciduous trees, spacious yards, and extensive landscaping-tend to have higher per capita residential waste generation. Suburban residential waste generation rates range from 1.8 pounds per capita per day in the sparsely vegetated community of Boulder, Colorado, to 6 pounds per capita per day in West Palm Beach, Florida and in the heavily foliated community of Berlin Township, New Jersey. Communities in the south, such as West Palm Beach, may have higher than average waste generation levels due to the year-round generation of yard debris. A high percentage of yard debris in the waste stream offers the potential to reach high composting levels. Indeed, both Berlin Township and West Palm Beach have high composting rates.

Smaller Communities Recover More of Their Solid Waste

Chart 2.3 provides information on the relationship of community demographics to the percentage of materials recovered from residential, commercial/institutional, and overall municipal solid waste.[4] The suburban communities of Berlin Township and Lincoln Park, New Jersey; Perkasie, Pennsylvania; and West Linn, Oregon; and the rural communities of Bowdoinham, Maine and Upper Township, New Jersey have the highest recovery levels among the 30 communities. Almost 80 percent of the 13 communities with residential, commercial, MSW, or total recovery rates above 40 percent have populations under 20,000. Although most of the communities with the highest levels of

Table 2.1
Demographic and MSW Recovery Data

Community	Type (a)	Population	Population Density (People/ Sq. Mile)	Per Capita Income (b)	Median Household Income (b)	Year Data Collected	MSW Generated (TPY)	MSW Recycled (TPY)	MSW Composted (TPY)	MSW Recovered (TPY)	% MSW Recycled (By Wt.)	% MSW Composted (By Wt.)	% MSW Recovered (By Wt.)
Austin, TX (c)	U	465,622	2,509	$16,000	$29,700	FY89	NA	68,079	8,418	76,497	NA	NA	NA
Berkeley, CA	U	102,724	5,707	$16,522	$34,200	FY91	103,975	20,366	3,000	23,366	20	3	22
Berlin Township, NJ	S	5,620	1,606	$11,420	NA	1990	7,889	2,177	2,339	4,517	28	30	57
Boulder, CO	S	88,000	3,826	$21,740	NA	1990	62,809	11,402	2,325	13,727	18	4	22
Bowdoinham, ME	R	2,189	95	$10,809	NA	FY90	606	261	68	329	43	11	54
Columbia, MO (c)	S	69,101	1,546	$11,078	NA	FY90	NA	NA	NA	NA	NA	NA	NA
Dakota County, MN	S/R	274,016	480	NA	NA	1990	229,986	46,724	16,602	63,326	20	7	28
Fennimore, WI	R	2,378	1,189	$14,046	NA	1990	1,279	322	169	491	25	13	38
King County, WA	S/R	991,060	486	NA	$37,500	1990	1,370,084	305,237	100,545	405,782	22	7	30
La Crescent, MN	R	4,305	1,957	$12,374	NA	1990	1,792	368	144	512	21	8	29
Lafayette, LA	S	90,000	2,195	$14,154	$23,961	FY90	73,656	5,565	2,211	7,776	8	3	11
Lincoln, NE	U	191,972	3,000	$16,067	$38,561	1990	220,184	25,108	2,302	27,410	11	1	12
Lincoln Park, NJ	S	10,978	1,582	$15,616	NA	1990	14,234	4,603	4,283	8,886	32	30	62
Mecklenburg Co., NC	U/R	511,433	942	$14,470	$27,656	1990	719,751	112,691	1,176	113,867	16	0	16
Monroe, WI	R	10,220	2,555	$15,565	$20,063	1989	12,660	3,163	417	3,580	25	3	28
Naperville, IL	S	85,351	2,845	$18,691	$60,690	1990	NA	NA	NA	NA	NA	NA	NA
Newark, NJ	U	275,221	11,280	$7,622	NA	1989	NA	NA	NA	NA	NA	NA	NA
Perkasie, PA	S	7,878	2,918	NA	NA	1990	NA	NA	NA	NA	NA	NA	NA
Peterborough, NH	R	5,239	146	$22,000	NA	1990	5,001	967	0	967	19	0	19
Philadelphia, PA	U	1,633,826	12,013	$10,266	NA	FY90	2,060,133	238,243	1,571	239,814	12	0	12
Portland, OR	U	440,000	3,188	16446	$23,238	1990	612,694	180,695	19,054	199,749	29	3	33
Providence, RI	U	160,728	8,459	NA	NA	1990	147,677	NA	NA	16,900	NA	NA	11
San Francisco, CA	U	723,959	14,775	$15,137	$28,530	1990	718,868	177,843	8,885	186,728	25	1	26
Seattle, WA	U	516,259	5,612	$21,137	NA	1990	738,910	241,148	53,188	294,336	33	7	40
Sonoma County, CA	R	388,222	244	$11,809	NA	1990	465,142	50,890	1,972	52,862	11	0	11
Takoma Park, MD	S	16,900	7,682	NA	NA	1990	NA	1,273	1,206	2,479	NA	NA	NA
Upper Township, NJ	R	10,861	170	$13,337	NA	1990	12,611	NA	NA	NA	NA	NA	NA
Wapakoneta, OH	R	9,214	205	$9,867	$36,600	9/89-8/90	9,253	1,369	455	1,824	15	5	20
West Linn, OR	S	16,557	2,365	$16,961	$30,111	1990	7,904	2,365	1,552	3,917	30	20	50
West Palm Beach, FL	S	62,530	1,421	NA	NA	4/90-3/91	120,717	2,983	12,434	15,417	2	10	13

Key:

NA = Not available R = Rural S = Suburban TPY = Tons per Year U = Urban

Notes:

MSW figures above exclude construction and demolition debris. See Appendix C for description of waste generation calculations and Appendix A for definitions of terms used above. Due to rounding, numbers may not appear to add to totals. In the cities of Upper Township, Philadelphia, and Newark waste is publicly or privately collected. Publicly collected waste consists primarily of residential waste and small business waste, privately collected waste includes waste from larger businesses, C&D debris, and in some cases, waste from large apartment buildings.

(a) Cities with populations greater than 100,000 are classified as urban.

(b) Per capita and median household income figures represent the lastest year for which data are available.

(c) Commercial/institutional waste disposed contains C&D and industrial waste. Thus, an MSW recovery rate cannot be calculated.

Table 2.2
Residential, Commercial, and C&D Materials Generated and Recovered

Community	Per Capita Residential Waste Generation (lbs/day)	Residential Waste Generated (TPY)	Com/Inst Waste Generated (TPY)	C&D Generated (TPY)	Total Waste Generated (TPY)	% Residential Materials Recovered (By Wt.)	% Com/Inst Materials Recovered (By Wt.)	% C&D Recovered (By Wt.)	% Total Waste Recovered (By Wt.)
Austin, TX	3.0	254,464	NA	NA	526,791	7	NA	0	15
Berkeley, CA	NA	NA	NA	59,626	163,601	NA	NA	66	38
Berlin Township, NJ	5.9	6,035	1,853	0	0	56	61	0	NA
Boulder, CO	1.8	29,204	33,605	26,766	89,575	33	12	1	16
Bowdoinham, ME	1.5 (b)	NA	NA	12	618	NA	NA	0	53
Columbia, MO (a)	2.4	30,857	51,971	NA	84,118	11	13	NA	13
Dakota County, MN	2.3	113,487	114,010	NA	NA	29	24	NA	NA
Fennimore, WI	1.5	648	631	NA	NA	51	25	NA	NA
King County, WA	4.4	646,109	541,116	NA	NA	19	36	NA	NA
La Crescent, MN	1.4	1,109	683	919	2,711	41	9	65	41
Lafayette, LA	2.1	34,651	39,005	NA	NA	13	8	NA	NA
Lincoln, NE	3.9	135,360	82,989	206,146	426,330	3	25	94	52
Lincoln Park, NJ	3.9	7,750	4,608	NA	NA	49	70	NA	NA
Mecklenburg Co., NC	3.1	292,897	425,678	NA	NA	7	22	NA	NA
Monroe, WI	2.2	3,802	8,858	6,142	18,802	32	27	96	50
Naperville, IL	3.2	39,020	NA	NA	NA	32	NA	NA	NA
Newark, NJ	NA	146,654	195,556	NA	342,210	10	46	NA	30
Perkasie, PA	2.4	3,133	NA	NA	NA	52	NA	NA	NA
Peterborough, NH	2.1	2,003	2,998	NA	NA	42	4	NA	NA
Philadelphia, PA	4.0	926,054	1,132,079	431,684	2,491,817	6	16	5	11
Portland, OR	NA	NA	NA	NA	NA	NA	NA	NA	NA
Providence, RI	3.0	80,677	67,000	NA	NA	10	13	NA	NA
San Francisco, CA	2.3	308,099	392,764	27,504	746,372	37	18	45	27
Seattle, WA	3.2	256,219	397,315	NA	NA	45	40	NA	NA
Sonoma County, CA	1.8	124,845	340,297	131,501	596,643	15	10	11	11
Takoma Park, MD	3.8	6,889	NA	NA	NA	36	NA	NA	NA
Upper Township, NJ	NA	6,879	5,733	NA	12,612	50	34	NA	43
Wapakoneta, OH	NA	NA	NA	NA	NA	NA	NA	NA	NA
West Linn, OR	2.1 (b)	NA	NA	1,977	9,881	NA	NA	30	46
West Palm Beach, FL	6.1	69,713	51,004	11,966	132,683	22	0	0	12

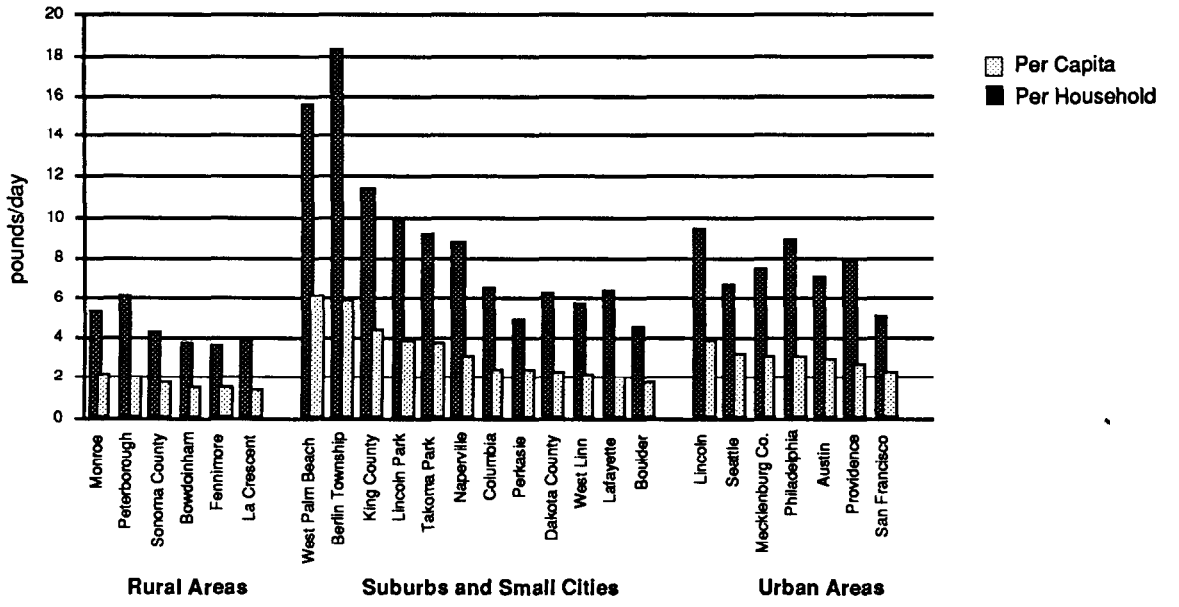
Key:
C&D=Construction and Demolition Debris
Com=Commercial
Inst=Institutional
NA=Not Available
TPY=Tons per Year
Wt.=Weight

Notes:
Total waste is the sum of residential, commercial/institutional, and C&D waste. See Appendix A for definitions of terms used above and Appendix C for description of waste generation calculations. Due to rounding, numbers may not appear to add to totals. In Philadelphia and Upper Township, figures for residential waste actually represent waste handled by the public sector (and may include some commercial waste), and figures for commercial/institutional waste actually represent waste handled by the private sector (and may include some residential waste).

(a) Columbia's total waste recovery rate represents recycling rates as yard waste tonnages were not available.

(b) Bowdoinham's per capita residential waste generation rate is based on MSW generation which contains material from 15 businesses; West Linn's per capita rate is based on estimates provided by the City's recycling coordinator on the percentage of MSW disposed that is residential.

Chart 2.1
Per Capita and Per Household Residential Waste Generation in Rural, Suburban, and Urban Communities



materials recovery are suburban or rural, Chart 2.3 shows that urban communities can also achieve significant recovery levels. Seattle, with a population of half a million, recovered 40 percent of its municipal solid waste stream and 45 percent of its residential waste in 1990. San Francisco is not far behind with a 1990 residential recovery rate of 37 percent. While Newark, New Jersey's public sector or residential recovery rate is fairly low at 10 percent, its private sector rate is significant at 46 percent. Several factors contribute to reaching high recovery rates: targeting a wide range of materials for recovery, establishing economic incentives, collecting source-separated yard waste for composting, extending program service beyond single-family households to apartment buildings and to the commercial and institutional sectors, and securing high levels of participation (through such strategies as offering convenient curbside and drop off service, mandating recycling, and establishing economic incentives). While the few communities that have integrated these key strategies tend to be small towns, large cities have also implemented them. (See Chapters 4, 5, and 6 for discussions on how communities reach high recovery levels.)

Large Cities Build On the Experience of Smaller Communities

Large metropolitan areas may consist of one or two relatively large and dense central cities and dozens or even hundreds of smaller suburban or even rural communities. The same, of course, is true for counties. The reader might find it useful to approach the information contained in this report and in the case study volumes by thinking of his or her metropolitan area or county not as a single entity but as dozens of small cities. Thus, the experience of a community like Berlin Township, New Jersey, may be instructive for a suburb outside Los Angeles, or even a neighborhood in Atlanta. New York City is currently conducting an intensive recycling project in a medium density, ethnically-mixed neighborhood of Park Slope, Brooklyn. The City is currently recovering 35 percent of the waste

generated in the pilot area, and has a goal of recovering 60 percent. By comparison, the citywide recovery level is only 6 percent. (For more information, see side bar, "New York City's Intensive Recycling Project," in Chapter 4.)

There are, of course, major differences of scale, demographics, and public service operations between small towns and large urban areas. Suburbs and rural areas tend to be more homogeneous, with most residents living in single-family homes. Urban areas have a more diverse socioeconomic mix, more residents living in multi-unit buildings, and generally a higher proportion of commercial and institutional waste. Cities that want to build on the experience of the successful recovery programs in small towns will need to take these differences into account.

Densely populated communities may, for example, have to use special outreach materials to encourage the participation of their non-English-speaking and transient residents in recycling programs. Providence, Rhode Island doubled participation in its curbside recycling program (from 30 to 60 percent) in certain multi-lingual neighborhoods by using special educational programs and foreign-language informational brochures on recycling.

Urban areas have tremendous potential for restructuring their solid waste systems and redirecting investment from disposal systems towards materials recovery. Large cities can secure dependable markets by guaranteeing brokers and end users large, steady quantities of secondary materials. Commercially generated recyclables, which are abundant in urban areas, can be a stable source of high-quality materials, depending on collection systems. Urban areas can also attract end users of such material to locate within or near their jurisdictions, especially if they demonstrate to potential investors a serious and long-term commitment to recycling. Since Philadelphia passed its mandatory recycling ordinance in 1987, at least 35 recycling companies have started up or expanded operations in the greater metropolitan area.

High Disposal Costs Lead to Higher Recovery Levels

Disposal costs in the form of tipping fees at landfills vary widely across the country.[5] Chart 2.4 compares MSW recovery rates with landfill and incinerator tipping or disposal fees among our 30 communities. With some exceptions, which are discussed below, those with the highest recovery rates also tend to have the highest tipping fees, while those with low tipping fees tend to have low recovery levels. In many cases, high disposal fees have spurred the initiation of comprehensive materials recovery programs. Lincoln Park, New Jersey, for example, has the highest MSW recovery level—62 percent in 1990-among our 30 communities; it also had the highest disposal fee for refuse in 1990-$119 per ton. Nowhere in the country has the effect of shrinking disposal capacity and rising disposal fees been felt more profoundly than in the Northeast. (Five of the six

Chart 2.2

Average Per Capita Residential Waste Generation in Rural, Suburban, and Urban Communities

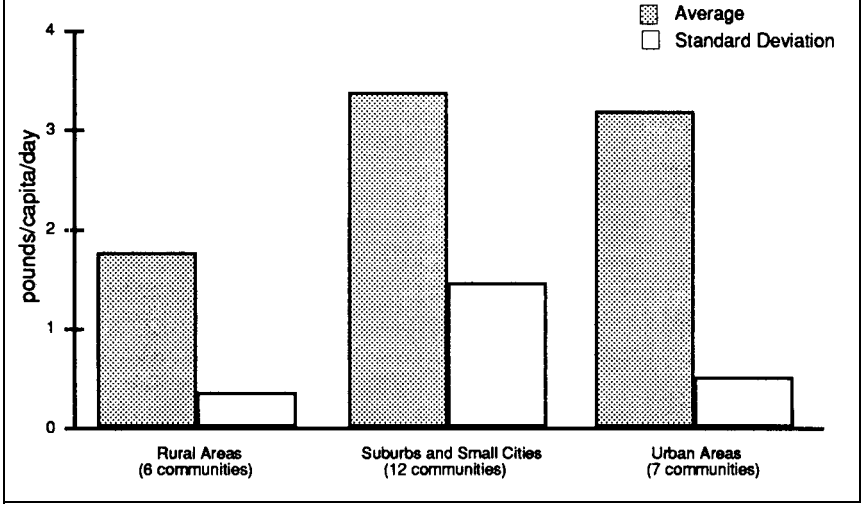
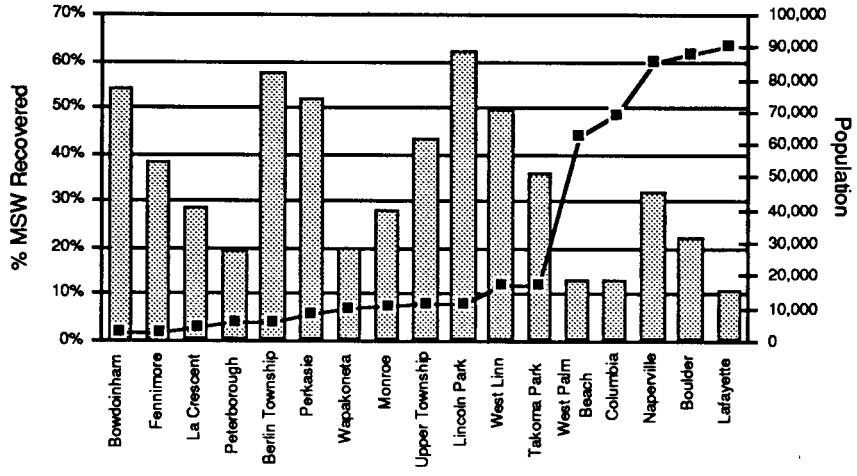


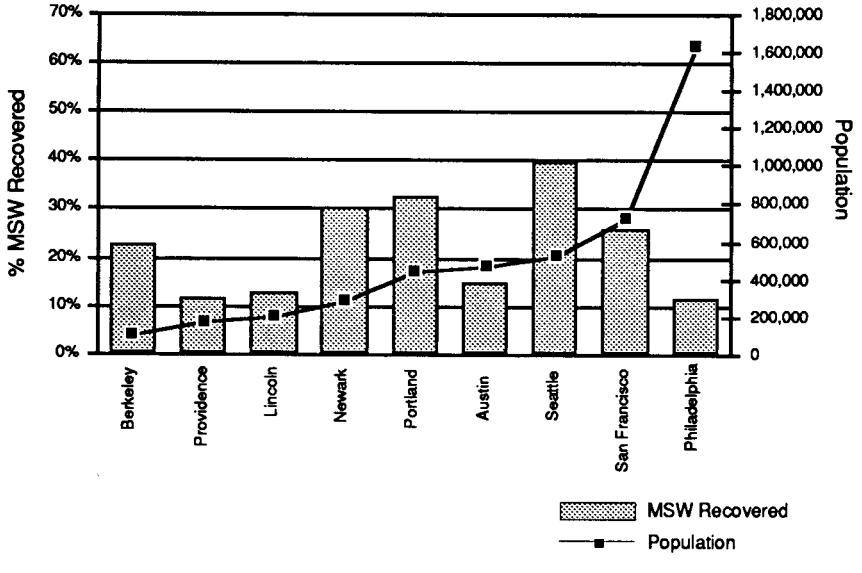
Chart 2.3

Population and MSW Recovery Levels

Rural Areas, Suburbs and Small Cities



Urban Areas



Notes: Total waste recovery levels are utilized for Upper Township, Columbia, Newark, and Austin as C&D cannot be separated from MSW. Residential recovery levels are utilized for Perkasie, Takoma Park, and Naperville as data on commercial waste generated and recovered are not available.

communities with the highest disposal fees are in the Northeast.) As a result, many of the most successful programs currently operating are in the Northeast region, and many of these are in New Jersey.

While communities in other parts of the country, such as the South, have been shielded from high disposal fees and thus have been slower to initiate programs, many of their programs show great promise and are already increasing recovery levels. Disposal fees are rising in many areas of the country not previously affected. West Palm Beach, Florida, for example, paid $47 per ton to dispose of waste in a local landfill in 1989. In 1990, when the City began to incinerate its waste, tipping fees jumped to $84 per ton. The Palm Beach County Solid Waste Authority is giving the development of recycling, composting, and source reduction programs top priority. Thus, we might expect recovery rates in West Palm Beach to increase in the near future.

In some communities, such as Monroe and Fennimore, Wisconsin and Naperville, Illinois, tipping fees are low but recovery rates are fairly significant. Landfill bans on certain recyclable

materials and State recycling requirements have provided impetus for recovery activities in these cases. The need to extend the life of its landfill has also spurred recycling activities in Monroe.

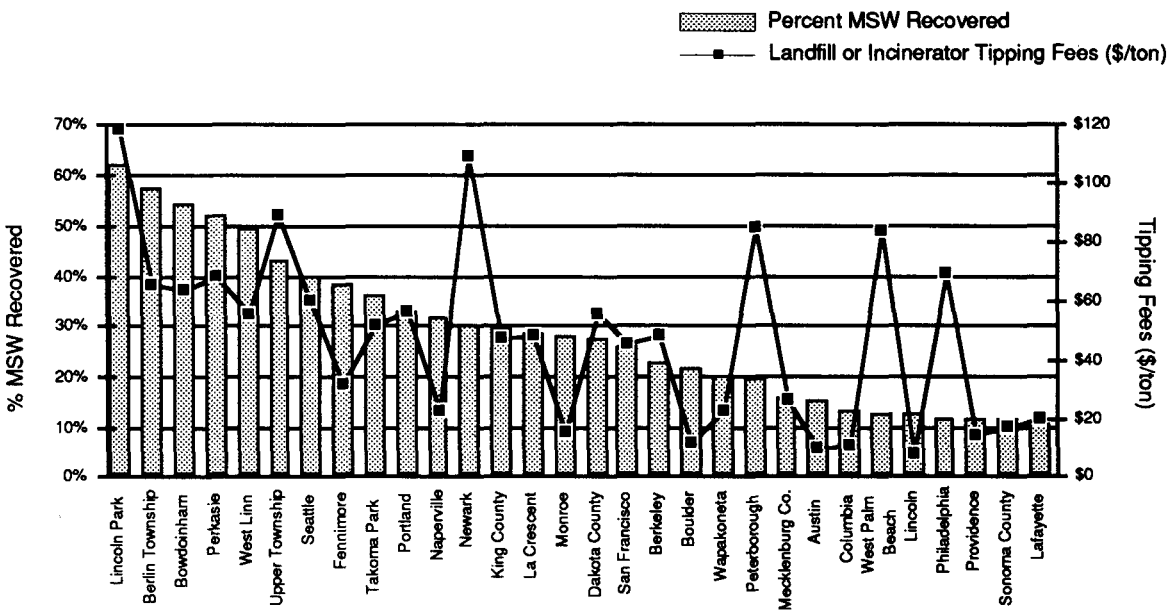
While Newark and Philadelphia have comparatively low overall MSW recovery levels and high disposal costs, these cities are actively implementing recycling programs. Newark's private sector is recovering 46 percent of the waste it handles, and the public sector provides curbside collection to approximately 90,000 households, or about 90 percent of total households in the City.[6] The City of Philadelphia offers curbside service to 169,000 households—more than any other municipality in our study. Taken together, the public and private sectors in Philadelphia are recovering more than 260,000 tons a year—an amount close to Seattle's yearly tonnage recovered. While Peterborough, New Hampshire's high disposal costs have not led to a high overall MSW recovery rate, the Town's residential recovery level is significant at 42 percent in 1990.

Conclusion

Residential waste generation varies widely from community to community. Rural areas appear to generate far less waste per person than suburban and urban areas. Yard waste contributes to high waste generation levels in many suburban communities; several of these have achieved high composting levels. While most of the half dozen communities recovering 50 percent or more of their residential or municipal solid waste have populations under 20,000, larger cities can also implement the key strategies contributing to high recovery levels. The following chapters describe these in more detail.

Chart 2.4

Landfill and Incinerator Tipping Fees and MSW Recovery Rates



Notes: Percent of total waste recovered is used for Austin, Columbia, Newark, and Upper Township; and percent of residential waste recovered is used for Naperville, Perkasie, and Takoma Park. MSW recovery rates are not available for these communities.

Notes

[1]1990 per capita income figure for Naperville is not available. Naperville's 1987 per capita income was $18,691; its 1990 median household income was $61,000.

[2]While Table 3.1 provides both per capita *residential* and *municipal solid waste* generation, we use only per capita and per household residential waste generation in Charts 2.1 and 2.2, as residential waste is directly dependent on population, unlike commercial/institutional waste. Readers interested in comparing waste generation levels to the national average of 4 pounds of waste per capita should use the *municipal solid waste* figures provided in Table 3.1. By and large, waste generation rates are based on tonnage figures provided by recycling coordinators and other local officials, who may have estimated the data or relied on other sources, such as private haulers. In several cases, communities measure materials in cubic yards and use conversion factors to calculate tonnage figures. In a few cases, ILSR staff have estimated tonnage recovered using commonly accepted conversion factors. In addition, figures may exclude untracked components of the waste stream. Residential waste handled by the private sector, for example, is sometimes excluded from residential figures. Total waste generation figures are divided by that portion of the population generating such material to arrive at per capita figures. See ILSR'S *In-Depth Studies of Recycling and Composting Programs: Designs, Costs, Results* for detailed information on how tonnage figures were derived. Appendix C in this report provides a community-by-community summary of which figures were estimated and how, and what, if any, component of the waste stream maybe excluded.

[3]One factor affecting the wide variation in per capita residential waste generation is the different methodologies local officials or haulers use to measure waste generation figures. ILSR staff have gone to considerable effort to make sure that figures *for* residential waste (as well as for commercial/institutional and overall municipal solid waste) include all the waste generated in that category. As mentioned above, any estimates or untracked/unmeasured components of the waste stream are identified in Appendix C.

[4]See Appendix A, Data Definitions and Methodology, for definitions of and methodology for determining residential, commercial, MSW, and total waste generation and recovery rates.

[5]Tipping fees tend to vary by region. The National Solid Waste Management Association's 1990 landfill tipping fee survey (based on almost 4 percent of the country's landfills) showed that average tipping fees were $65 per ton in the Northeast, $41 per ton in the mid-Atlantic, $23 to $26 per ton in the West and Midwest, and $11 to $17 per ton in the Southeast, Southwest, and the Plains. (Source *1990 Landfill Tipping Fee Survey,* National Solid Waste Management Association, Washington, DC, 1991.) This survey is based on 219 landfills. By the end of 1991, there were 5,812 landfills in the country.

[6]Newark has already noticed an increase in the amount of residential material collected since it increased recyclables pick-up from biweekly to weekly in October 1991.